

CAZON
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Ministry of Environment and Energy

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FOR YOUR **information**W16
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Water pollution control plant operation

In Ontario's larger urban centres, municipal wastewater is most often treated using an activated sludge process. This method of biological treatment removes between 90 and 95 per cent of the solids in the wastewater, resulting in a high quality effluent.

The activated sludge process works as follows:

Influent works

The wastewater enters the water pollution control plant through influent channels under the influent building. On entering the channels it passes first through screens, which filter out large objects that could damage the equipment, and then through a shredding device which reduces particles in the water to a size that can easily be handled by the equipment.

Grit removal

From the shredder, the wastewater flows into a collector well, then it is pumped up to the grit removal facilities located next to the influent building. The heavier particles of grit and sand in the water are removed so they don't damage the equipment or interfere with the operation of the digesters.

The grit and sand settle to the bottom of the tanks and are periodically removed and taken to a disposal area.

Primary settling

The wastewater then flows into the primary settling tanks — the first step in the removal of organic materials. It may take as long as two hours for the wastewater to pass through the tanks. During that time, about 60 per cent of the solids settle to the bottom. The solid material — called raw sludge — is drawn from the tanks and delivered to the digesters for further treatment.

A skimming mechanism removes the surface scum and delivers it to the digesters. The partially treated wastewater, called primary effluent, flows from the tanks, over a weir, and into a collector channel.

Aeration

The primary effluent flows into another set of tanks, called aeration tanks, where most of the remaining organic matter is oxidized by aerobic bacteria. To do their job, the bacteria require an abundance of oxygen which is supplied by air compressors.

The air creates enough agitation in the tanks to prevent settling. As bacteria oxidize the organic matter, a light sludge floc (a mass of light suspended particles) is formed. The floc or activated sludge is the medium upon which the bacteria grow.

Final settling

The discharge from the aeration section flows into the final settling tanks where it is retained for about three hours to allow the activated sludge to settle. The sludge is removed and pumped back into the aeration section to be mixed with the primary effluent.



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This transfer "seeds" the primary effluent and maintains the bacteriological process. Any unwanted sludge is transferred to the digesters.

Up to this point, between 90 and 95 per cent of the solids in the wastewater have been removed. The settled water or final effluent flows out from the tanks, over a weir, and into collector channels which deliver it to the chlorine contact chamber.

Chlorination

Here, the effluent is mixed with a chlorine solution to destroy any remaining bacteria. An outfall sewer carries the disinfected effluent to the river or lake.

Some water pollution control plants have incorporated a nutrient removal stage in which ferric chloride is added to the treatment process. The ferric acid reacts with phosphates in the sewage, forming an insoluble iron phosphate which settles out in the clarifier, thus reducing the amount of phosphorus discharged to the water.

Digestion

The raw sludge removed from the primary settling tanks, the surface scum, and any excess activated sludge are delivered to the digesters for further treatment.

Sludge digestion at this point is carried out in two stages. In the first stage, primary digestion, anaerobic bacteria (bacteria living in the absence of oxygen) partially break down the sludge into various substances. The contents are mixed constantly to ensure overall treatment.

The second stage, secondary digestion, completes the process. To encourage settling the contents are not agitated.

During the digestion process, gas — mainly methane — is produced and collected in the top of the digesters. The gas is used as a fuel for maintaining a constant temperature of about 32 degrees Celsius in the digesters. It is also used to fuel the plant boilers which heat the building. Excess gas is burned off by a waste gas burner.

Vacuum filtration

At some plants, the sludge must be dewatered to cut down on the volume trucked away for disposal.

The dewatering is done with vacuum filters. A large drum covered with closely spaced steel coils or a cloth blanket passes through a trough and picks up the chemically pre-conditioned digested sludge. A vacuum is created within the drum. Atmospheric pressure pushes water through the digested sludge to the drum, leaving a sludge cake on the surface. A scraper separates the sludge cake from the surface and drops it onto a conveyor which carries it to a holding area.

If you are interested in visiting a water pollution control plant, call your municipality or local Ministry of the Environment office for the location of the one nearest you. Visits can be arranged with the plant superintendent.

For more information on what is being done to protect water quality in Ontario, call or write:

Public Information Centre
Environment Ontario
135 St. Clair Ave. West
Toronto, Ont.
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(416) 323-4321.

From outside the 416 area, call 1-800-565-4923.

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